West Virginia Nitrogen Application Timing Criteria Based on Environmental Sensitivity of Sites

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Fact Sheet 4/10/13

I. Introduction

This document should be used by WV nutrient management planners to complete the nitrogen component of a plan. Because of the nature of nitrogen, a planner must determine appropriate rate of application, the best form of nitrogen to use, the time of the year that the plant will be able to best use the applied nitrogen and the correct location to apply the nitrogen to ensure the maximum uptake by the plants in the field. Understanding this document, the terms, and then following the guidance based on the associated table will allow the planner to develop a site specific nitrogen plan by soil type for the WV farmer.

II. Timing Criteria

This criteria is to be used in conjunction with Table 1

a. Timing recommendations for nutrient sources containing nitrogen shall be as close to plant nutrient uptake periods as reasonably possible. A certified nutrient management planner shall utilize procedures contained in this document and the West Virginia CAFO Nutrient Management Standards and Criteria (2011) to determine the timing of nutrient applications. To reduce the potential for nutrient leaching or runoff, a certified nutrient management planner shall recommend applications of nitrogen-containing materials only to sites where an actively growing crop is in place at the time of application or where a timely planted crop will be established within 30 days of the planned nutrient application, except as specified in subdivisions II.b through d of this subsection. If such nutrient applications are made to fall-seeded crops such as small grain, the crop planted shall be capable of germination and significant growth before the onset of winter so the crop is able to take up the available applied nitrogen.

b. Organic nutrient source applications may be applied at differing times than specified in subdivision II.a of this subsection in order to manage storage constraints in accordance with the following conditions:

(1) Applications of organic nutrient sources shall be within 60 days of planting a spring seeded crop to sites that are not environmentally sensitive sites as identified below in Table 1 according to 'Management of Environmentally Sensitive Sites', except as specified in subdivision II.b(2) of this subsection. Such nutrient applications shall not exceed allowable application rates of the spring seeded crop;

(2) Applications shall be within 90 days of planting a spring seeded crop to sites that meet all of the following requirements:

(a) Are not environmentally sensitive sites as identified below in Table 1 according to 'Management of Environmentally Sensitive Sites'; (b) Have slopes of less than 7.0% throughout the application area unless: (i) at least 60% uniformly distributed crop residue cover exists following application or (ii) the application and any associated tillage is in conformance with an existing and implemented soil conservation plan meeting NRCS requirements for the site; and

(c) The organic sources being applied are one of the following: semi-solid beef manure, semisolid dairy manure with sawdust bedding or straw bedding. Such nutrient applications shall not exceed allowable application rates of the spring planted crop;

(3) Applications of organic nutrient sources may occur prior to the times specified in subdivisions II.b(1) and II.b(2) of this subsection on:

(a) Sites that are not environmentally sensitive sites if all of the following requirements are met:

(i) a trap crop exists that has reached a Zadoks growth stage of 23 or greater having a uniform stand throughout the site area of at least 20 plants per square foot; (ii) the trap crop shall be allowed to continue growing on the entire site until within two weeks of the spring crop planting date; (iii) all such nitrogen applications of organic nutrient sources to trap crops shall not exceed the crop nutrient needs of the upcoming spring planted crop subtracting at least 30 pounds per acre of nitrogen to be reserved for use as a banded starter fertilizer at the time of spring planting; and (iv) the rate of organic nutrient source applied does not smother the crop.

(b) Environmentally sensitive sites as identified in below in Table 1 according to 'Management of Environmentally Sensitive Sites', in addition to those criteria outlined in subdivision II.b(3)(a) of this subsection, such applications to a trap crop must be within 60 days of planting a spring planted crop.

c. Composted organic nutrient sources having a final carbon to nitrogen ratio of 20:1 or greater are exempt from requirements of subdivisions II.a and II.b of this subsection if analyzed for carbon to nitrogen ratio at the conclusion of the composting process and results are obtained prior to land application. The planner shall recommend soil nitrate testing to determine nitrogen application rates during the growing season following the application of composted organic nutrient sources.

d. The nutrient management planner shall recommend split application of inorganic nitrogen fertilizers as starter or broadcast and side dressing or top dressing in row crops and small grains consistent with procedures contained in West Virginia CAFO Nutrient Management Standards and Criteria (2011), on environmentally sensitive sites as identified below in Table 1 according to 'Management of Environmentally Sensitive Sites'. Split applications of inorganic nitrogen fertilizers and irrigation scheduling shall be recommended for crops to receive irrigation. The use of a pre-side dress nitrogen test (PSNT) can help to determine nitrogen needs during the growing period. In lieu of split applications, the planner may recommend the application of the total nitrogen requirement for spring-planted row crops within one week prior to planting if at least 50% of the plant available nitrogen requirement of the crop is supplied with slowly available nitrogen sources.

III. Definitions

The words and terms used in this document shall have the following meanings unless the context clearly indicates otherwise.

"Application rate" or "nutrient rate" means the quantity of major nutrients, nitrogen as N, phosphorus as P2O5, and potassium as K2O on a per acre basis to supply crop or plant nutrient needs, and to achieve realistic expected crop yields.

"Banding" or "sideband" means the placement of fertilizer approximately two inches to the side and two inches below the seed.

"Broadcast" means the uniform application of a material over a field.

"Cereal crop" or "small grain" means barley, rye, triticale, or wheat.

"Certified nutrient management planner" or "nutrient management planner" or "planner" means a person who holds a current West Virginia nutrient management certificate of competence.

"Composted organic nutrient source" means the relatively stable, humus-like product resulting from the controlled aerobic, thermophilic biological decomposition of organic material that bears little physical resemblance to the raw materials from which it originated.

"Crop" means cultivated plants or agricultural produce such as grain, silage, forages, oilseeds, vegetables, fruit, nursery stock, or turf grass.

"Cropland" means land used for the production of grain, oilseeds, silage, industrial crops, and any other category of crop not defined as specialty crop, hay, or pasture.

"Crop nutrient needs" means the primary nutrient requirements of a crop determined as pounds per acre or pounds per 1,000 square feet of nitrogen as N, phosphorus as P2O5 , and potassium as K2O required to support crop growth for production of an expected crop yield based upon soil analysis results as specified in West Virginia CAFO Nutrient Management Standards and Criteria (2011), or West Virginia Commercial Vegetable Production Recommendations for 2012.

"Dry manure" or "semisolid manure" means manure containing less than 85.5% moisture.

"Expected crop yield" means a realistic crop yield for a given farm field determined by using yield records or soil productivity information.

"Fertilizer" means any organic or inorganic material of natural or synthetic origin that is added to a soil to supply certain nutrients essential to plant growth.

"Field" means a unit of contiguous open land generally used for crop production that is separated by permanent boundaries, such as fences, permanent waterways, woodlands, crop lines not subject to change because of farming practices, and other similar features or as determined by the United States Department of Agriculture Farm Service Agency.

"Groundwater" means any water beneath the land surface in a water saturated layer of soil or rock.

"Leaching" means the movement of soluble material, such as nitrate, in solution through the soil profile by means of percolation.

"Liquid manure" means manure containing at least 85.5% moisture or which can be applied through subsurface injection or surface application with liquid application equipment.

"Manure" or "animal waste" means animal fecal and urinary excretions and waste by products which may include spilled feed, bedding litter, soil, lactase, process wastewater, and runoff water from animal confinement areas.

"NRCS" means the United States Department of Agriculture, Natural Resource Conservation Service, formerly the Soil Conservation Service (SCS).

"Nutrient" means an element or compound essential as raw materials for plant growth and development such as carbon, nitrogen, and phosphorus.

"Nutrient management plan" or "plan" means a plan prepared by a West Virginia certified nutrient management planner to manage the amount, placement, timing, and application of manure, fertilizer, or other materials containing plant nutrients in order to reduce nutrient loss to the environment and to produce crops.

"Organic nutrient source" or "organic source" means manure, green manure, compost, or other plant or animal residues which contain plant nutrients.

"Plant available nutrients" means the portion of nutrients contained in nutrient sources which is expected to be available for potential use by plants during the growing season or the crop rotation.

"Pre-sidedress nitrate test" or "PSNT" means a procedure used to help determine soil nitrate-nitrogen levels at a specific time during a corn crop growing season.

"Runoff" means that part of precipitation, snow melt, or irrigation water that runs off the land into streams or other surface water which can carry pollutants from the land.

"Shall" means a mandatory requirement.

"Should" means a recommendation.

"Slope" means the degree of deviation of a surface from horizontal, measured as a percentage, as a numerical ratio, or in degrees.
"Sidedress" means the placement of fertilizer beside or between the rows of a crop after crop emergence.

"Sinkhole" means a depression in the earth's surface caused by dissolving of underlying limestone, salt, or gypsum having drainage patterns through underground channels.

"Slowly available nitrogen" means nitrogen sources that have delayed plant availability involving compounds which dissolve slowly, materials that must be microbially decomposed, or soluble compounds coated with substances highly impermeable to water such as polymer coated products, methylene urea, isobutylidene diurea (IBDU), urea formaldehyde based (UF), sulfur coated urea, and natural organics.

"Soil management group" means a grouping of soils based on their similarity in profile characteristics which affect crop production and require specific soil and crop management practices.

"Soil series" means a classification of a specific soil type by name based on the morphological, chemical and physical properties of the soil.

"Soil survey" means a published or electronically available document developed by a governmental entity using the standards and protocols of the National Cooperative Soil Survey that includes detailed descriptions and classifications of soils, mapping of various soil series, and the interpretation of soils according to their adaptability for various crops and trees.

"Split application" means utilizing a sequence of two or more nutrient applications, separated by approximately three weeks or more, to a single crop in order to improve nutrient uptake efficiency.

"Surface water" means all water whose surface is exposed to the atmosphere.

"Trap crop" means a timely planted cereal crop for the purposes of capturing residual soil nitrogen and nitrogen that is released during the decomposition of manure in order to manage limited manure storage availability.

"Volatilization" means a process by which nitrogen is lost to the atmosphere as ammonia gas.

"Zadoks' growth stage" means the numerical scale ranging from 0-93 which assigns values to small grain growth stages, e.g. Growth Stage 30 is just prior to the stem elongation phase in wheat growth.

Adapted from the Virginia Nutrient Management Training Certification Regulations 4 VAC 5-15, Revised January 2006. Virginia Department of Conservation and Recreation Division of Soil and Water Conservation 203 Governor Street, Suite 206 Richmond VA 23219

Adaptation and preparation by Joshua W. Faulkner, Agricultural Engineering Specialist and Tom Basden, Nutrient Management Specialist, WVU Extension Service.

Management of Environmentally Sensitive Sites

An *environmentally sensitive site* is defined to mean "any field that is particularly susceptible to nutrient loss to groundwater or surface water because it contains or drains to areas which contain sinkholes; or where at least 33% of the area in a specific field contains one or any combination of the following features:

1. Soils with high potential for leaching based on soil texture or excessive drainage;
2. Shallow soils less than 41 inches deep likely to be located over fractured or limestone bedrock;
3. Subsurface tile drains;
4. Soil with high potential for surface runoff based on poor drainage;
5. Floodplains as identified by soils prone to frequent flooding in county soil surveys; or
6. Lands with slopes greater than 15%."

Table 1 contains environmental risk ratings for West Virginia soils for the first four criteria listed above. Determine the percentage of field area for soils listed as H (high) for Environmental Sensitivity Rating in Table 1 plus any field areas that meet criteria 5 or 6 above to determine if the field is an environmentally sensitive site.

Category Ratings

Based on these criteria, soils were judged to have Moderate or High environmental sensitivity risk if one of the following conditions was present:

- Soils with (i) a sandy particle size class, (ii) a rock fragment content greater than 35%, or (iii) a drainage class of excessively or somewhat excessively drained present a potential for **leaching** loss.
- Soils that are less than or equal to 40 inches deep over fractured or limestone bedrock are **shallow** and present a potential for subsurface loss.
- Soils with subsurface tile drains present a potential for **drainage** loss.
- Soils with a drainage class of somewhat poorly, poorly, or very poorly drained present a potential for surface runoff due to **wetness**.

Specifically, soils with a **Leaching** limitation are:

- Soils with a sandy particle size class are rated as having a High risk.
- Soils with a drainage class of excessively drained or somewhat excessively drained are rated as having a High risk.
- Soils with a rock fragment content greater than 35% formed from calcareous residual parent materials are rated as having a High risk.
- Other soils with a rock fragment content greater than 35% are rated as having a Moderate risk.
- Soils with a coarse-loamy particle size class are rated as having Moderate risk.

Soils with a **Shallow** limitation are:

- Soils that are less than or equal to 20 inches deep over bedrock are rated as having a High risk.
- Soils that are great than 20 inches but less than or equal to 40 inches over bedrock are rated as having a Moderate risk.

Soils with a **Drainage** limitation are:

- Soils with artificial subsurface drainage are rated as having a High risk.

Soils with a **Wetness** limitation are:

- Soils with a drainage class of poorly or very poorly drained are rated as having a High risk.
- Soils with a drainage class of somewhat poorly drained are rated as having a Moderate risk.

The category ratings should be used to develop nitrogen application programs to address this concern through rate and timing recommendations.

Table 1 that follows lists the environmental sensitivity rating and category for each soil in West Virginia.

Adapted from the Virginia Nutrient Management Standards and Criteria, Revised October 2005. Virginia Department of Conservation and Recreation Division of Soil and Water Conservation 203 Governor Street, Suite 206 Richmond VA 23219

Adaptation and preparation by Joshua W. Faulkner, Agricultural Engineering Specialist and Tom Basden, Nutrient Management Specialist, WVU Extension Service.

Table 1. West Virginia Soil Management Groupings with Environmental Sensitivity Ratings

Prepared by Jim Thompson, WVU Division of Plant & Soil Sciences
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Soil Series	Sensitivity	Limitation
Airmont	M	Wetness
Albrights	M	Wetness
Albrights (drained)	H	Drainage
Allegheny	L	-
Alluvial Land, wet	M	Leaching
Andover	H	Wetness
Andover (drained)	H	Drainage
Ashton	L	-
Atkins	H	Wetness
Atkins (drained)	H	Drainage
Bagtown	M	Leaching
Barbour	M	Leaching
Basher	L	-
Basher (drained)	H	Drainage
Beech	L	-
Beech (drained)	H	Drainage
Belmont	L	-
Benevola	L	-
Berks	M	Leaching
Bethesda	M	Leaching
Bigpool	L	-
Blackthorn	M	Leaching
Blago	H	Wetness
Blago (drained)	H	Drainage
Blairton	M	Shallow
Blairton (drained)	H	Drainage
Braddock	L	-
Brevard	L	-
Brickhaven	L	-
Briery	M	Leaching
Brinkerton	H	Wetness
Brinkerton (drained)	H	Drainage
Brooke	M	Shallow
Brooke (drained)	H	Drainage
Brookside	L	-
Brookside (drained)	H	Drainage
Buchanan	M	Wetness
Buchanan (drained)	H	Drainage
Calvin	M	Shallow
Caneyville	M	Shallow
Captina	L	-
Captina (drained)	H	Drainage
Carbo	M	Shallow

Soil Series	Sensitivity	Limitation
Cardova	M	Shallow
Cateache	M	Shallow
Catoctin	M	Leaching
Cavode	M	Wetness
Cavode (drained)	H	Drainage
Cedarcreek	M	Leaching
Chagrin	L	-
Chavies	L	-
Chilhowie	M	Shallow
Clarksburg	L	-
Clarksburg (drained)	H	Drainage
Clearbrook	M	Shallow
Clearbrook (drained)	H	Drainage
Clifftop	M	Shallow
Clifton	L	-
Cloverlick	M	Leaching
Clymer	L	-
Combs	M	Leaching
Conotton	M	Leaching
Cookport	L	-
Cookport (drained)	H	Drainage
Coolville	L	-
Coolville (drained)	H	Drainage
Cotaco	M	Wetness
Cotaco (drained)	H	Drainage
Craigsville	M	Leaching
Culleoka	M	Shallow
Dekalb	H	Leaching
Dormont	L	-
Dormont (drained)	H	Drainage
Downsville	M	Leaching
Duffield	L	-
Duncannon	L	-
Dunmore	L	-
Dunning	H	Wetness
Dunning (drained)	H	Drainage
Edgemont	L	-
Edom	L	-
Elk	L	-
Elkins	H	Wetness
Elkins (drained)	H	Drainage
Elliber	H	Leaching
Endcav	L	-
Ernest	L	-
Ernest (drained)	H	Drainage
Fairplay	H	Wetness
Fairplay (drained)	H	Drainage
Fairpoint	M	Leaching
Faywood	M	Shallow

Soil Series	Sensitivity	Limitation
Fedscreek	M	Leaching
Fenwick	M	Shallow
Fiveblock	H	Leaching
Frankstown	L	-
Frederick	L	-
Funkstown	L	-
Gallia	L	-
Gallipolis	L	-
Gallipolis (drained)	H	Drainage
Gauley	M	Leaching
Gilpin	M	Shallow
Ginat	H	Wetness
Ginat (drained)	H	Drainage
Glenford	L	-
Glenford (drained)	H	Drainage
Grigsby	M	Leaching
Guernsey	L	-
Gurensey (drained)	H	Drainage
Guyan	M	Wetness
Guyan (drained)	H	Drainage
Guyandotte	M	Leaching
Hackers	L	-
Hagerstown	L	-
Hazleton	M	Leaching
Highsplint	M	Leaching
Holly	H	Wetness
Holly (drained)	H	Drainage
Huntington	L	-
Hustontown	L	-
Itmann	H	Leaching
Janelew	M	Leaching
Jefferson	L	-
Kanawha	L	-
Kaymine	M	Leaching
Klinesville	H	Shallow
Laidig	L	-
Lakin	H	Leaching
Landes	M	Leaching
Lappans	H	Leaching
Latham	M	Shallow
Latham (drained)	H	Drainage
Lawrence	M	Wetness
Leatherbark	M	Shallow
Leatherbark (drained)	H	Drainage
Leetonia	H	Leaching
Lehew	H	Leaching
Lickdale	H	Wetness
Lickdale (drained)	H	Drainage
Licking	L	-

Soil Series	Sensitivity	Limitation
Licking (drained)	H	Drainage
Lily	M	Shallow
Linden	M	Leaching
Lindside	L	-
Lindside (drained)	H	Drainage
Litz	M	Leaching
Lobdell	L	-
Lobdell (drained)	H	Drainage
Lodi	L	-
Lowell	L	-
Macove	M	Leaching
Mandy	M	Leaching
Markland	L	-
Markland (drained)	H	Drainage
Marrowbone	M	Leaching
Matewan	H	Leaching
McGary	M	Wetness
McGary (drained)	H	Drainage
Meckesville	L	-
Melvin	H	Wetness
Melvin (drained)	H	Drainage
Mertz	H	Leaching
Middlebury	L	-
Middlebury (drained)	H	Drainage
Monongahela	L	-
Monongahela (drained)	H	Drainage
Moshannon	L	-
Murrill	L	-
Muskingum	M	Shallow
Myersville	L	-
Myra	M	Leaching
Nallen	M	Shallow
Nelse	M	Leaching
Nolin	L	-
Nollville	L	-
Nolo	H	Wetness
Nolo (drained)	H	Drainage
Oaklet	L	-
Omulga	L	-
Omulga (drained)	H	Drainage
Opequon	H	Shallow
Orriville (drained)	H	Drainage
Orrville	M	Wetness
Otwell	L	-
Otwell (drained)	H	Drainage
Peabody	M	Shallow
Pecktonville	L	-
Philo	L	-
Philo (drained)	H	Drainage

Soil Series	Sensitivity	Limitation
Pineville	L	-
Poorhouse	M	Wetness
Poorhouse (drained)	H	Drainage
Pope	M	Leaching
Poplimento	L	-
Potomac	H	Leaching
Purdy	H	Wetness
Purdy (drained)	H	Drainage
Ramsey	H	Shallow
Rayne	L	-
Robertsville	H	Wetness
Robertsville (drained)	H	Drainage
Rough	H	Shallow
Rushtown	H	Leaching
Ryder	M	Shallow
Schaffenaker	M	Shallow
Sciotoville	L	-
Sciotoville (drained)	H	Drainage
Secnecaville (drained)	H	Drainage
Sees	L	-
Senecaville	L	-
Sensabaugh	L	-
Sensabaugh (drained)	H	Drainage
Sewell	H	Leaching
Sharpcrest	L	-
Shelocta	L	-
Shelocta (drained)	H	Drainage
Shircliff	L	-
Shircliff (drained)	H	Drainage
Shouns	L	-
Sideling	L	-
Simoda	L	-
Skidmore	M	Leaching
Snowdog	L	-
Speedwell	L	-
Stumptown	M	Leaching
Summers	M	Leaching
Swanpond	L	-
Swanpond (drained)	H	Drainage
Sylvatus	H	Shallow
Taggart	M	Wetness
Taggart (drained)	H	Drainage
Tarhollow	L	-
Thurmont	L	-
Tilsit	L	-
Tioga	L	-
Toms	M	Wetness
Toms (drained)	H	Drainage
Trego	L	-

Soil Series	Sensitivity	Limitation
Trussel	H	Wetness
Trussel (drained)	H	Drainage
Tygart	M	Wetness
Tygart (drained)	H	Drainage
Tyler	M	Wetness
Tyler (drained)	H	Drainage
Upshur	L	-
Vandalia	L	-
Vanderlip	H	Leaching
Vertrees	L	-
Vincent	L	-
Vincent (drained)	H	Drainage
Weikert	H	Shallow
Wellston	L	-
Westmoreland	L	-
Weverton	M	Leaching
Wharton	L	-
Wharton (drained)	H	Drainage
Wheeling	L	-
Whiteford	L	-
Woodsfield	L	-
Yeager	H	Leaching
Zoar	L	-
Zoar (drained)	H	Drainage